CyanoHABs – The Florida Experience

John Burns
PBS&J, Jacksonville, Florida 32256
jwburns@pbsj.com

Cyanobacteria are common in Florida freshwater, estuarine, and marine environments and are considered an important natural component of many aquatic ecosystems. Local climate patterns, natural and modified hydrologic condition, trophic status, and a growing population (~17 million) are all conducive to cyanobacterial blooms. Concurrent toxic cyanobacterial blooms where ongoing during August 2005 in the Lower St. Johns River, Lake Okeechobee, Caloosahatchee River, St. Lucie River, and the C-51 Canal (West Palm Beach, FL). Toxin was detected at all locations, with maximum Microcystin concentrations reported at 164 µg L^{-1} (West Palm Beach), 373 µg L^{-1} (St. Lucie River), and >1400 µg L^{-1} (Lower St. Johns River).

Recurring toxic cyanobacterial blooms are found throughout the state with monitoring programs initiated on the Lower St. Johns River, Lake Okeechobee, Caloosahatchee River, St. Lucie River, the C-51 Canal, and the Harris Chain of Lakes (central Florida). *Microcystis*, *Anabaena*, *Cylindrospermopsis*, *Aphanizomenon*, *Planktothrix* and *Lyngbya* are common genera in Florida that are known to form blooms. Cyanotoxins detected in Florida waters include Microcystin, Anatoxin-A, Cylindrospermopsin, Lyngbyatoxin-A, Debromoaplysiatoxin, and Saxitoxins. Habitat loss due to phytoplankton shading of submerged macrophytes and animal mortalities (e.g., fish, birds, alligators) have been reported during cyanobacterial bloom events. Moreover, human illness (e.g., skin rashes, blistering, respiratory distress, diarrhea) has also been reported in Florida following recreational exposure to cyanobacterial scums and mat forming *Lyngbya* species. Although effective water treatment methods are available for the removal and conversion of cyanotoxins, Microcystin, Cylindrospermopsin, and Anatoxin-A have been detected in Florida's post-treated drinking water during bloom events. Little evidence of cyanotoxins in Florida tap water during bloom events are known to exist.

Cyanotoxin data has been collected in Florida on a limited basis following an initial 1999 state-wide survey of cyanobacterial toxins by the Florida Harmful Algal Bloom Task Force. During this survey (YR-2000), bloom-forming cyanobacteria were found distributed throughout the state with cyanotoxins detected in surface waters and post-treated drinking water. Microcystin concentration was most often detected within the 0.1 to 10 µg L^{-1} range with a maximum concentration of 107 µg L^{-1}. Microcystin was detected in post-treated drinking water at a maximum concentration of ~10 µg L^{-1}. Anatoxin-A was not detected in most samples collected, but a maximum concentration of 156 µg L^{-1} was detected in one sample. Anatoxin-A was detected in post-treated drinking water at ~10 µg L^{-1}. Cylindrospermopsin was detected during this survey and represents the first report of Cylindrospermopsin in North America. Cylindrospermopsin concentration was found most often between 10 and 100 µg L^{-1}. The maximum Cylindrospermopsin concentration detected in surface waters was 202 µg L^{-1}. The maximum concentration of Cylindrospermopsin detected in post-treated drinking water was ~100 µg L^{-1}. Lyngbya blooms are common in Florida, forming mats in freshwater

springs and overgrowing some coastal reefs. Low levels of Lyngbya-toxin-A, debromoaplysiatoxin, and saxitoxin have been detected, with saxitoxin reported to demonstrate toxic effects to biota.

It's difficult to identify trends in the frequency of toxic cyanobacterial blooms in Florida due to the limited availability of cyanotoxin data. However, chlorophyll-a data and other water quality constituents have been collected by state and federal agencies over a sufficient time period to address water quality trends. Florida has been addressing eutrophic water bodies, including cyanobacteria, for many years through water management activities and restoration efforts. Surface Water Improvement Management (SWIM) plans have been developed and identify a list of priority water bodies in need of restoration. Florida has also addressed impaired waters through the development of Pollution Load Goals and Total Maximum Daily Loads. The Florida Harmful Bloom Task Force has specifically addressed toxic algal blooms in both fresh and marine waters following special appropriations from the Florida Legislature. The potential for human health effects from cyanobacteria and other harmful algae has been addressed by the Florida Department of Health with support from the Centers for Disease Control and Prevention. It is the opinion of the author that Florida could better address toxic cyanobacterial blooms and associated ecological degradation and the potential for human illnesses via improved cyanotoxin monitoring programs, coordination of surface water managers with health and water treatment officials, and regulatory guidelines that are based on known ecological and human health risk factors.